

A Sheet Music Organisation System

Interim Report

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Contents

1	Introduction	2
2	Aims and Objectives	4
2.1	Project Aim	4
2.2	Primary Objectives	4
2.3	Secondary Objectives	4
3	References	5

1 Introduction

This project focuses on the organisation and display of sheet music. Sheet music refers only to the instructions given to a performer in order to play a composition, and does not include the sound output produced when the piece is performed. Any reference to music from this point onward should be assumed to mean visual sheet music, rather than audio recordings. Whilst Eastern countries and previous eras have used different methods of notation (Kaufman, 1967), this project focuses solely on the notation used by western classical music. This type of musical notation is the format most commonly used by orchestras and performers, and in order to understand the problem of organising it, some explanation of the key elements will be required.

Notation of western classical music has used a combination of diastematic and orthographic notation (Rastall, 1982) since the advent of Gregorian chant around 640AD (Taruskin, 2005). The function of this notation falls into two main divisions: the expression of relationship in sound frequency, and the expression of relationship in time, or measure (Warner, 1929).

The representations of other parameters in staff notation are normally orthographic, such as indications *p* - meaning piano, or "quiet" - and *pizz* - meaning pizzicato, or "plucked" (Rastall, 1982). This mechanism is complex in nature, and has a large but finite set of symbols which control every element of the composition. This will be discussed and explained later in this report.

Despite the advantages of digitising music collections notated using this system, the majority of musicians choose to store music physically, using filing cabinets and music cabinets as storage mechanisms (Sullivan, 2012). This can be attributed to the lack of standardisation for browsing and organising digital sheet music. PDF is the standard digitisation method for documents, which presents a problem for musicians wanting to search by multiple methods because the format does not include meta information about what the document contains, (Good, 2013) as well as the usability of PDF browsers in musical performances. Whilst the latter has largely been solved by tablet applications (ForScore, LLC, 2014), organisation, searching and filtering PDF files is still largely a manual task, with most applications allowing for manual input, but with little to none handling automatic information retrieval (MusicReader, 2015). Further alternative software solutions proving this point will be discussed later in the report.

A further problem in digitising music collections is merging online collections with offline collections, which is not improved by many online and offline music retailers providing only physical copies of compositions (Musicroom, 2015). In other words, as collections of music grow, it becomes a long and arduous task to convert physical documents to digital files, and from there to manually attribute meta data for each and every piece.

The physical method avoids this problem, but is still fraught with problems of manual organisation, made more difficult by the need to index or else duplicate files in order to organise collections by multiple methods. This problem is due to music cabinets only allowing the user to view the top document, as well as sheet music books often only providing bibliography information on the front cover, meaning the spine of books does not tell a user what the book contains (Feist, 2012).

This is further complicated by specific use cases, such as music cabinets used by multiple musicians who each play several different instruments. In a solo use case, it may be possible to organise by title, instrument, or composer, but in the given use case finding one which unifies all users needs is difficult.

A further example would be a musical director for an orchestra, who wishes to not only find a specific piece, but find compositions which would work well in a concert schedule. In this case it would be of use to know more than the bibliography of a piece, but information such as time, speed and instruments information without having to physically look or memorise each piece's information. For this reason many larger Orchestras have a dedicated Orchestral Librarian (Association, 2015), who will handle manual organisation, maintenance and research of the library. This indicates that library sizes take a lot of maintenance, and manual conversion and extraction of meta data to convert a physical library to a digital collection would take a long time.

As such, this project solves the organisation problem by extracting meta data about sheet music automatically, with additional features provided in order to improve the usability and shorten the amount of time needed to create and expand a digital collection of music. This document discusses the aims and objectives of this

project, technical scope and depth of the project, process and method used to produce the solution, and finally critical evaluation of the project as a whole.

2 Aims and Objectives

2.1 Project Aim

The overall aim of the project is to design and develop a sheet music library application, with the ability to organise and view personal sheet music collections, and download sheet music from the internet. Time permitting, it should also be able to generate sound from the sheet music, and import editable music from flat images.

2.2 Primary Objectives

The following objectives are of the highest importance to the project, and are a measure of whether the project has been completed.

- **Rendering of Musical Files**
It will be necessary to render one or more formats of commonly stored musical files, as the aim of the project is to enable users to view and organise their sheet music collections.
- **Extraction of Metadata**
The project will be required to extract important information from each piece, ranging from the simple nominal data such as title, composer, lyricist, to the more complex notation such as clefs, key signatures and meters used.
- **Ability to search metadata extracted and auto-generate playlists**
From the extracted metadata it should be possible to search the catalog of music for specific requirements, such as key, clef, meter, time signature (explained in the background section). The system should also be capable of generating playlists based on related data.
- **Connection to Online Music Collections**
It should also be possible to connect to online music collections, as it would be beneficial to users to be able to search and add to their collections using the same interface.

2.3 Secondary Objectives

The secondary objectives are to be completed only if they do not threaten the completion of primary objectives.

- **Audio playback**
It would be useful to a cross section of users to be able to play music files as sound clips. This enables performers who regularly play with an accompany musician or ensemble to create practice accompaniments from their sheet music, or hear an approximation of how a melody should sound.
- **MusicOCR conversion of images to parseable Music files**
It would be easier for musicians to merge their physical and virtual music collections for automatic organisation if the solution provided a way to import flat, scanned sheet music into marked-up music files.

3 References

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